

CLAIMS

What is claimed is:

1. An antibody or antigen-binding fragment thereof which binds to a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor, wherein said
5 antibody or antigen-binding fragment thereof inhibits binding of a ligand to the receptor.
2. An antibody or antigen-binding fragment according to Claim 1, wherein said antibody or antigen-binding fragment thereof inhibits one or more functions associated with binding of the ligand to the receptor.
- 10 3. An antibody or antigen-binding fragment thereof according to Claim 1, wherein the mammalian CC-chemokine receptor 4 (CCR4) is a human CC-chemokine receptor 4 (CCR4).
4. An antibody or antigen-binding fragment thereof according to Claim 1, wherein the antibody is selected from the group consisting of:
15 a) monoclonal antibody 1G1;
b) an antibody having an epitopic specificity which is the same as or similar to that of 1G1;
c) an antibody which can compete with 1G1 for binding to mammalian CC-chemokine receptor 4 (CCR4);
20 d) monoclonal antibody 2B10;
e) an antibody having an epitopic specificity which is the same as or similar to that of 2B10;
f) an antibody which can compete with 2B10 for binding to mammalian CC-chemokine receptor 4 (CCR4);

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- g) monoclonal antibody 10E4;
 - h) an antibody having an epitopic specificity which is the same as or similar to that of 10E4;
 - i) an antibody which can compete with 10E4 for binding to mammalian CC-chemokine receptor 4 (CCR4); and
 - 5 j) antigen-binding fragments of any one of (a) through (i) which bind to mammalian CC-chemokine receptor 4 (CCR4) or a portion thereof.
5. An antibody or antigen-binding fragment thereof according to Claim 1, wherein the ligand is a chemokine.
 - 10 6. An antibody or antigen-binding fragment thereof according to Claim 5, wherein the chemokine is any one or more of TARC, MDC, MCP-1, MIP-1 α and RANTES.
 7. The 1G1 hybridoma cell line deposited under ATCC Accession No. HB-12624.
 8. The 2B10 hybridoma cell line deposited under ATCC Accession No. HB-12625.
 - 15 9. A monoclonal antibody produced by the hybridoma cell line according to Claim 7 or an antigen-binding fragment thereof.
 10. A monoclonal antibody produced by the hybridoma cell line according to Claim 8 or an antigen-binding fragment thereof.
 11. A test kit for use in detecting the presence of a mammalian CC-chemokine receptor 4 (CCR4) or portion thereof in a biological sample comprising
 - 20 a) at least one antibody or antigen-binding fragment thereof which binds to a mammalian CC-chemokine receptor 4 (CCR4) or portion of said

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receptor, wherein said antibody or antigen-binding fragment thereof inhibits binding of a ligand to the receptor; and

- b) one or more ancillary reagents suitable for detecting the presence of a complex between said antibody or antigen-binding fragment thereof and said mammalian CC-chemokine receptor 4 (CCR4) or a portion thereof.

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12. A test kit according to Claim 11, wherein the antibody is selected from the group consisting of

- i) monoclonal antibody 1G1;
ii) an antibody having an epitopic specificity which is the same as or similar to that of 1G1;
iii) an antibody which can compete with 1G1 for binding to mammalian CC-chemokine receptor 4 (CCR4);
iv) monoclonal antibody 2B10;
v) an antibody having an epitopic specificity which is the same as or similar to that of 2B10;
vi) an antibody which can compete with 2B10 for binding to mammalian CC-chemokine receptor 4 (CCR4);
vii) monoclonal antibody 10E4;
viii) an antibody having an epitopic specificity which is the same as or similar to that of 10E4;
ix) an antibody which can compete with 10E4 for binding to mammalian CC-chemokine receptor 4 (CCR4); and
x) antigen-binding fragments of any one of (i) through (ix) which bind to mammalian CC-chemokine receptor 4 (CCR4) or a portion thereof.

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13. A method of inhibiting the interaction of a cell bearing mammalian CC-chemokine receptor 4 (CCR4) with a ligand thereof, comprising contacting said cell with an effective amount of an antibody or antigen-binding fragment thereof

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which binds to mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor and inhibits binding of said ligand to the receptor.

14. A method according to Claim 13, wherein the cell is selected from the group consisting of lymphocytes, monocytes, granulocytes, T cells, basophils, and cells comprising a recombinant nucleic acid encoding CCR4 or a portion thereof.
15. A method according to Claim 14, wherein the T cells are selected from the group consisting of CD8+ cells, CD25+ cells, CD4+ cells and CD45RO+ cells.
16. A method according to Claim 13, wherein the ligand is a chemokine.
17. A method according to Claim 16, wherein the chemokine is any one or more of TARC, MDC, MCP-1, MIP-1 α and RANTES.
18. A method according to Claim 13, wherein the antibody or antigen-binding fragment thereof is selected from the group consisting of:
- a) monoclonal antibody 1G1;
 - b) an antibody having an epitopic specificity which is the same as or similar to that of 1G1;
 - c) an antibody which can compete with 1G1 for binding to mammalian CC-chemokine receptor 4 (CCR4);
 - d) monoclonal antibody 2B10;
 - e) an antibody having an epitopic specificity which is the same as or similar to that of 2B10;
 - f) an antibody which can compete with 2B10 for binding to mammalian CC-chemokine receptor 4 (CCR4);
 - g) monoclonal antibody 10E4;

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- h) an antibody having an epitopic specificity which is the same as or similar to that of 10E4;
- i) an antibody which can compete with 10E4 for binding to mammalian CC-chemokine receptor 4 (CCR4); and
- 5 j) antigen-binding fragments of any one of (a) through (i) which bind to mammalian CC-chemokine receptor 4 (CCR4) or a portion thereof.

19. A method of detecting expression of mammalian CC-chemokine receptor 4 (CCR4) or portion thereof by a cell or fraction of said cell, comprising:
- 10 a) contacting a composition comprising a cell or fraction of said cell to be tested with an antibody or antigen-binding fragment thereof which binds to mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor and inhibits binding of said ligand to the receptor, under conditions appropriate for binding of said antibody or antigen-binding fragment thereof to a mammalian CCR4 or portion thereof; and
 - 15 b) detecting binding of said antibody or antigen-binding fragment thereof, wherein the binding of said antibody or antigen-binding fragment thereof indicates the presence of said receptor or portion of said receptor on said cell.
20. A method according to Claim 19, wherein the antibody or antigen-binding fragment thereof is selected from the group consisting of:
- 20 i) monoclonal antibody 1G1;
 - ii) an antibody having an epitopic specificity which is the same as or similar to that of 1G1;
 - iii) an antibody which can compete with 1G1 for binding to mammalian CC-chemokine receptor 4 (CCR4);
 - 25 iv) monoclonal antibody 2B10;
 - v) an antibody having an epitopic specificity which is the same as or similar to that of 2B10;

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- vi) an antibody which can compete with 2B10 for binding to mammalian CC-chemokine receptor 4 (CCR4);
- vii) antigen-binding fragments of any one of (i) through (vi) which bind mammalian CC-chemokine receptor 4 (CCR4) or a portion thereof;
- 5 viii) monoclonal antibody 10E4;
- ix) an antibody having an epitopic specificity which is the same as or similar to that of 10E4;
- x) an antibody which can compete with 10E4 for binding to mammalian CC-chemokine receptor 4 (CCR4); and
- 10 xi) combinations of the foregoing.
21. The method according to Claim 20, wherein the composition is a sample comprising human cells.
22. A method of detecting a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor, comprising:
- 15 a) contacting a sample to be tested with an antibody or antigen-binding fragment thereof which binds to mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor and inhibits binding of said ligand to the receptor under conditions appropriate for binding of said antibody or fragment thereof to said mammalian CCR4 or portion thereof; and
- 20 b) detecting or measuring binding of said antibody or antigen-binding fragment thereof,
- wherein the binding of said antibody or antigen-binding fragment thereof to material in said sample is indicative of the presence of a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor in said sample.
- 25 23. A method according to Claim 22, wherein the antibody or antigen binding fragment thereof is selected from the group consisting of:

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- i) monoclonal antibody 1G1;
 - ii) an antibody having an epitopic specificity which is the same as or similar to that of 1G1;
 - 5 iii) an antibody which can compete with 1G1 for binding to mammalian CC-chemokine receptor 4 (CCR4);
 - iv) monoclonal antibody 2B10;
 - v) an antibody having an epitopic specificity which is the same as or similar to that of 2B10;
 - vi) an antibody which can compete with 2B10 for binding to mammalian
 - 10 CC-chemokine receptor 4 (CCR4);
 - vii) monoclonal antibody 10E4;
 - viii) an antibody having an epitopic specificity which is the same as or similar to that of 10E4;
 - ix) an antibody which can compete with 10E4 for binding to mammalian
 - 15 CC-chemokine receptor 4 (CCR4);
 - x) antigen-binding fragments of any one of (i) through (ix) which bind to mammalian CC-chemokine receptor 4 (CCR4) or a portion thereof; and
 - xi) combinations of the foregoing.
24. A method according to Claim 22, wherein the sample is a cellular fraction
- 20 which, in normal individuals, comprises a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor.
25. A method of inhibiting a function associated with binding of a chemokine to a mammalian CC-chemokine receptor 4 (CCR4) or a functional portion of said receptor, comprising contacting a composition comprising the receptor or
- 25 portion with an effective amount of an antibody or antigen-binding fragment thereof which binds to a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor, wherein said antibody or fragment inhibits binding of

said chemokine to mammalian CC-chemokine receptor 4 (CCR4) and inhibits one or more functions associated with binding of the chemokine to the receptor.

26. A method according to Claim 25, wherein the chemokine is any one or more of TARC, MDC, MCP-1, MIP-1 α and RANTES.
27. A method according to Claim 25, wherein the antibody or antigen-binding fragment is selected from the group consisting of:
- a) monoclonal antibody 1G1;
 - b) an antibody having an epitopic specificity which is the same as or similar to that of 1G1;
 - c) an antibody which can compete with 1G1 for binding to mammalian CC-chemokine receptor 4 (CCR4);
 - d) monoclonal antibody 2B10;
 - e) an antibody having an epitopic specificity which is the same as or similar to that of 2B10;
 - f) an antibody which can compete with 2B10 for binding to mammalian CC-chemokine receptor 4 (CCR4);
 - g) monoclonal antibody 10E4;
 - h) an antibody having an epitopic specificity which is the same as or similar to that of 10E4;
 - i) an antibody which can compete with 10E4 for binding to mammalian CC-chemokine receptor 4 (CCR4); and
 - j) antigen-binding fragments of any of (a) through (i) which bind to mammalian CC-chemokine receptor 4 (CCR4) or a portion thereof.
28. A method of detecting or identifying an agent which binds a mammalian CC-chemokine receptor 4 (CCR4) or ligand-binding variant thereof, comprising combining

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- a) an agent to be tested;
- b) an antibody or antigen-binding fragment which binds to a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor, wherein said antibody or antigen-binding fragment thereof inhibits binding of a ligand to the receptor; and
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- c) a composition comprising a mammalian CC-chemokine receptor 4 (CCR4) or a ligand-binding variant thereof, under conditions suitable for binding of said antibody or antigen-binding fragment to said mammalian CC-chemokine receptor 4 (CCR4) or ligand-binding variant thereof, and detecting or measuring binding of said antibody or antigen-binding fragment to said mammalian CC-chemokine receptor 4 (CCR4) or ligand-binding variant thereof.
29. A method according to Claim 28, wherein the antibody or antigen-binding fragment thereof is selected from the group consisting of:
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- a) monoclonal antibody 1G1;
- b) an antibody having an epitopic specificity which is the same as or similar to that of 1G1;
- c) an antibody which can compete with 1G1 for binding to mammalian CC-chemokine receptor 4 (CCR4);
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- d) monoclonal antibody 2B10;
- e) an antibody having an epitopic specificity which is the same as or similar to that of 2B10;
- f) an antibody which can compete with 2B10 for binding to mammalian CC-chemokine receptor 4 (CCR4);
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- g) monoclonal antibody 10E4;
- h) an antibody having an epitopic specificity which is the same as or similar to that of 10E4;

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- i) an antibody which can compete with 10E4 for binding to mammalian CC-chemokine receptor 4 (CCR4);
 - j) antigen-binding fragments of any of (a) through (i) which bind to mammalian CC-chemokine receptor 4 (CCR4) or a portion thereof; and
 - 5 k) combinations of the foregoing.
30. A method according to Claim 28, wherein the formation of a complex between said antibody or antigen-binding fragment and said mammalian CC-chemokine receptor 4 (CCR4) or ligand-binding variant is monitored, and wherein a decrease in the amount of complex formed relative to a suitable control is
- 10 indicative that the agent binds said receptor or ligand-binding variant thereof.
31. A method according to Claim 28, wherein the composition comprising a mammalian CC-chemokine receptor 4 (CCR4) or a ligand-binding variant thereof is a cell bearing recombinant CC-chemokine receptor 4 (CCR4) or ligand-binding variant thereof.
- 15 32. A method according to Claim 28, wherein the composition comprising a mammalian CC-chemokine receptor 4 (CCR4) or a ligand-binding variant thereof is a membrane fraction of said cell bearing recombinant CC-chemokine receptor 4 (CCR4) or ligand-binding variant thereof.
- 20 33. A method according to Claim 28, wherein the antibody or antigen-binding fragment thereof is labeled with a label selected from the group consisting of a radioisotope, spin label, antigen label, enzyme label, fluorescent group and chemiluminescent group.

34. A method according to Claim 28, wherein the agent is an antibody having specificity for a mammalian CC-chemokine receptor 4 (CCR4) or antigen-binding fragment thereof.
35. A method of inhibiting leukocyte trafficking in a patient, comprising administering to the patient a composition comprising an effective amount of an antibody or antigen-binding fragment thereof which binds to a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor and inhibits binding of a ligand to the receptor.
36. A method according to Claim 35, wherein the ligand is a chemokine.
37. A method according to Claim 36, wherein the chemokine is any one or more of TARC, MDC, MCP-1, MIP-1 α and RANTES.
38. A method according to Claim 35, wherein the antibody or antigen-binding fragment thereof is selected from the group consisting of:
- a) monoclonal antibody 1G1;
 - b) an antibody having an epitopic specificity which is the same as or similar to that of 1G1;
 - c) an antibody which can compete with 1G1 for binding to mammalian CC-chemokine receptor 4 (CCR4);
 - d) monoclonal antibody 2B10;
 - e) an antibody having an epitopic specificity which is the same as or similar to that of 2B10;
 - f) an antibody which can compete with 2B10 for binding to mammalian CC-chemokine receptor 4 (CCR4);
 - g) monoclonal antibody 10E4;

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- h) an antibody having an epitopic specificity which is the same as or similar to that of 10E4;
- i) an antibody which can compete with 10E4 for binding to mammalian CC-chemokine receptor 4 (CCR4); and
- 5 j) antigen-binding fragments of any of (a) through (i) which bind to mammalian CC-chemokine receptor 4 (CCR4) or a portion thereof.
39. A composition comprising an antibody or antigen-binding fragment thereof which binds to a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor, wherein said antibody or antigen-binding fragment thereof inhibits
- 10 binding of a ligand to the receptor, and an optional physiologically acceptable vehicle.
40. An antibody or antigen-binding fragment thereof which binds to a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor, wherein said antibody or antigen-binding fragment thereof inhibits binding of a ligand to the
- 15 receptor with an IC_{50} of less than about 1.5 μ g/ml.
41. An antibody or antigen-binding fragment thereof which binds to a mammalian CC-chemokine receptor 4 (CCR4) or portion of said receptor, wherein said antibody or antigen-binding fragment thereof inhibits binding of a ligand to the receptor with an IC_{50} of less than about 1.5 ng/ml.
- 20 42. A method of treating a CC-chemokine receptor 4 (CCR4)-mediated disorder in a patient, comprising administering to the patient an effective amount of an antibody or antigen-binding fragment thereof which binds to mammalian CC-chemokine receptor 4 (CCR4) or portion thereof.

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43. A method of treating an inflammatory disorder in a patient, comprising administering to the patient an effective amount of an antibody or antigen-binding fragment thereof which binds to mammalian CC-chemokine receptor 4 (CCR4) or portion thereof.

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44. The 10E4 hybridoma cell line deposited under ATCC Accession No. PTA-1203.
45. A monoclonal antibody produced by the hybridoma cell line according to Claim 44 or an antigen-binding fragment thereof.

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